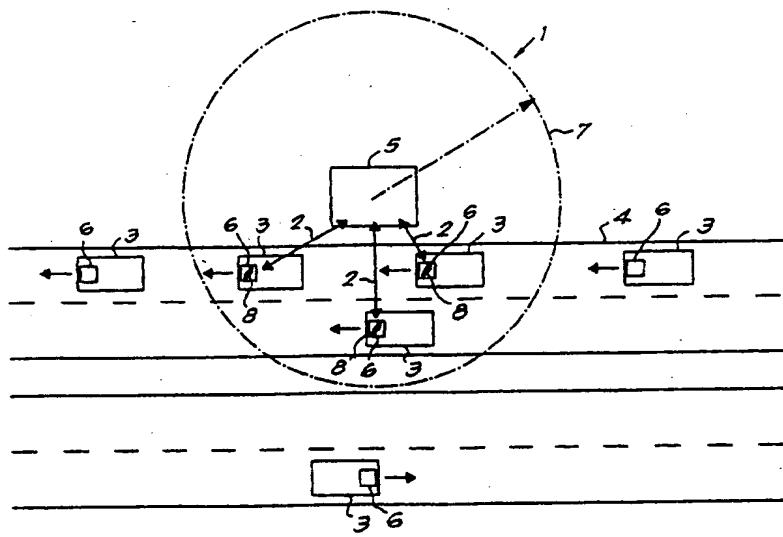




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(54) Title: METHOD AND DEVICE FOR ESTABLISHING A WIRELESS COMMUNICATION BETWEEN VEHICLES AND COMMUNICATION EQUIPMENT ERECTED ALONG THE ROAD



## (57) Abstract

Method for establishing a wireless communication between vehicles and communication equipment erected along the road, in particular a communication (2) between one or several modules (6) provided to the respective vehicles (3) and communication equipment (5) along the road (4), characterized in that use is made for the communication (2) of the "direct sequence spread spectrum" principle, also called the "direct access broad spectrum" principle, whereby several modules (6) of such vehicles (3) can simultaneously communicate with the above-mentioned communication equipment (5) on one and the same frequency band, and whereby each communicating module (6) is distinguished from the other ones to this end on the basis of an allotted code (8).

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5 Method and device for establishing a wireless communication between vehicles and communication equipment erected along the road.

10 The present invention concerns a method and a device for establishing a wireless communication between vehicles and communication equipment along the road.

15 The invention is designed in the first place for exchanging data between a vehicle and a transmitting station and/or receiving station along the road, among others data related to toll driving.

20 Systems for exchanging data between vehicles and communication equipment along the road are already known, but these known systems are little suitable for toll driving, as they cannot transmit the data concerned with sufficient certainty in the often short time available.

25 Also, the present invention concerns a method and device for establishing such a communication which does not have the above-mentioned disadvantage, in other words which allow for a two-way communication which, even with a transmission and receiving range extending over a very short distance, for example a few metres, makes it possible to have a very reliable data exchange between a 30 module in a car, in particular a riding car, and receiving equipment erected along the road in a very short time.

To this end, the invention in the first place concerns a

method for establishing a wireless communication between vehicles and communication equipment erected along the road, in particular a communication between one or several modules provided to the respective vehicles and

5 communication equipment along the road, characterized in that use is made for the communication of the "direct sequence spread spectrum" principle, also called the "direct access broad spectrum" principle, whereby several modules of such vehicles can simultaneously communicate

10 with the above-mentioned communication equipment on one and the same frequency band, and whereby each communicating module is distinguished from the other ones to this end on the basis of an allotted code.

15 The use of what is called the "direct sequence spread centrum" principle, offers the advantage that a large number of communication links can be simultaneously established with the modules of several passing vehicles. Another major advantage of applying the "direct sequence

20 spread centrum" principle for such a communication consists in that a good communication can be established with very great certainty, in other words a communication whereby all the required information is transmitted, even when the vehicles pass at a very high speed and thus are

25 situated within the range of the equipment used for merely some tenths of a second. The data to be transmitted are coded very redundantly by means of the above-mentioned code, so that even a partial loss of the transmission is compensated by the redundancy of the

30 data.

Preferably, a two-way communication is established to this end.

Further, for the above-mentioned code is preferably used what is called a pseudo arbitrary code.

According to the most preferred embodiment, use is made  
5 of what is called the "DSRC microwave band" for the above-mentioned frequency band, which is situated at about 5.8 Gigahertz.

According to the most preferred embodiment, also the  
10 content of the communication will be secured, in particular by cryptographically transforming it so as to allow for authentication of the source and/or encryption of the data.

15 According to a particular embodiment, the communication equipment along the road will be mobile, in particular it will be equipment which can be moved and/or wheeled, so that it can be easily used in different places.

20 Further, the invention also concerns a device for realizing the above-mentioned method, characterized in that it consists of the combination of a multiple of modules which are to be build in and/or are built in respectively in vehicles on the one hand, and  
25 communication equipment which is erected and/or can be erected along the road on the other hand, whereby these modules and this communication equipment is provided with electronics which make it possible for the communication equipment to communicate with the modules situated within  
30 the transmission and receiving range of said communication equipment by means of a wireless connection at short distance, such by means of a communication making use of the "direct sequence spread centrum" principle, also called "direct access broad spectrum"

principle.

In order to better explain the characteristics of the invention, the following preferred embodiment is 5 described as an example only without being limitative in any way, with reference to the sole accompanying drawing, which schematically represents a device according to the invention, applied for toll driving:

10 As is represented in the accompanying figure, the invention concerns a device 1 for establishing a wireless communication, in particular a two-way communication 2, between vehicles 3 which are situated on a road 4, and communication equipment 5 which is erected along the road 15 4, for example on the side thereof.

The two-way communication 2 is hereby carried out by means of modules 6 which are provided to this end in the vehicles 3.

20 The invention is special in that, on condition that the necessary electronics are provided in the communication equipment 5 and in the modules 6, a communication 2 is established with every vehicle 3, making use of the 25 "direct sequence spread spectrum" principle, also called the "direct access broad spectrum" principle, whereby all modules 6 situated within the range 7 of the transmission and receiving equipment used hereby, can communicate with the above-mentioned communication equipment 5 on one and 30 the same frequency band, as every communicating module 6 is distinguished from another one on the basis of the allotted code 8.

The use of the "direct sequence spread spectrum"

principle allows for a very solid communication. As is known, data are hereby transmitted in such a digitized manner that even when interferences occur whereby certain digits are lost, the transmitted data can still be 5 perceived with great if not complete certainty, so that no second attempt has to be made to communicate, as is the case with other systems known until now which are used to establish communication links between riding vehicles and a beacon or such along the road.

10

Thanks to the fact that a reliable communication can always be established as of the first request according to the invention, the necessary data can be transmitted in a very short time, so that also very fast vehicles 3, 15 which are merely present within the range 7 for a fraction of a second, can be intercepted in the case of toll driving.

Moreover, by allotting a pseudo arbitrary code 8 to the 20 different modules 6 as mentioned above, the different modules can be easily distinguished, in other words can be easily identified.

As mentioned above, it is clear that the invention both 25 concerns the method used hereby as the whole of components for realizing said method.

It is clear that the above-mentioned modules 6 are not necessarily independent units which are built in in the 30 vehicles 3, but that they can also be electronic circuits which are part of the onboard computer or such of the vehicles 3 concerned.

The present invention is by no means limited to the.

embodiment described as an example and represented in the drawing; on the contrary, such a method and device for establishing such a wireless communication can be made according to several variants while still remaining 5 within the scope of the invention.

Claims.

5

1. Method for establishing a wireless communication between vehicles and communication equipment erected along the road, in particular a communication (2) between one or several modules (6) provided to the respective vehicles (3) and communication equipment (5) along the road (4), characterized in that use is made for the communication (2) of the "direct sequence spread spectrum" principle, also called the "direct access broad spectrum" principle, whereby several modules (6) of such vehicles (3) can simultaneously communicate with the above-mentioned communication equipment (5) on one and the same frequency band, and whereby each communicating module (6) is distinguished from the other ones to this end on the basis of an allotted code (8).

20

2. Method according to claim 1, characterized in that a two-way communication (2) is established by means of the above-mentioned principle.

25 3. Method according to claim 1 or 2, characterized in that for the above-mentioned code (8) is used what is called a pseudo arbitrary code.

30 4. Method according to any of the preceding claims, characterized in that for the above-mentioned frequency band, use is made of what is called the "DSRC microwave band", which is situated at about 5.8 Gigahertz.

5. Method according to any of the preceding claims,

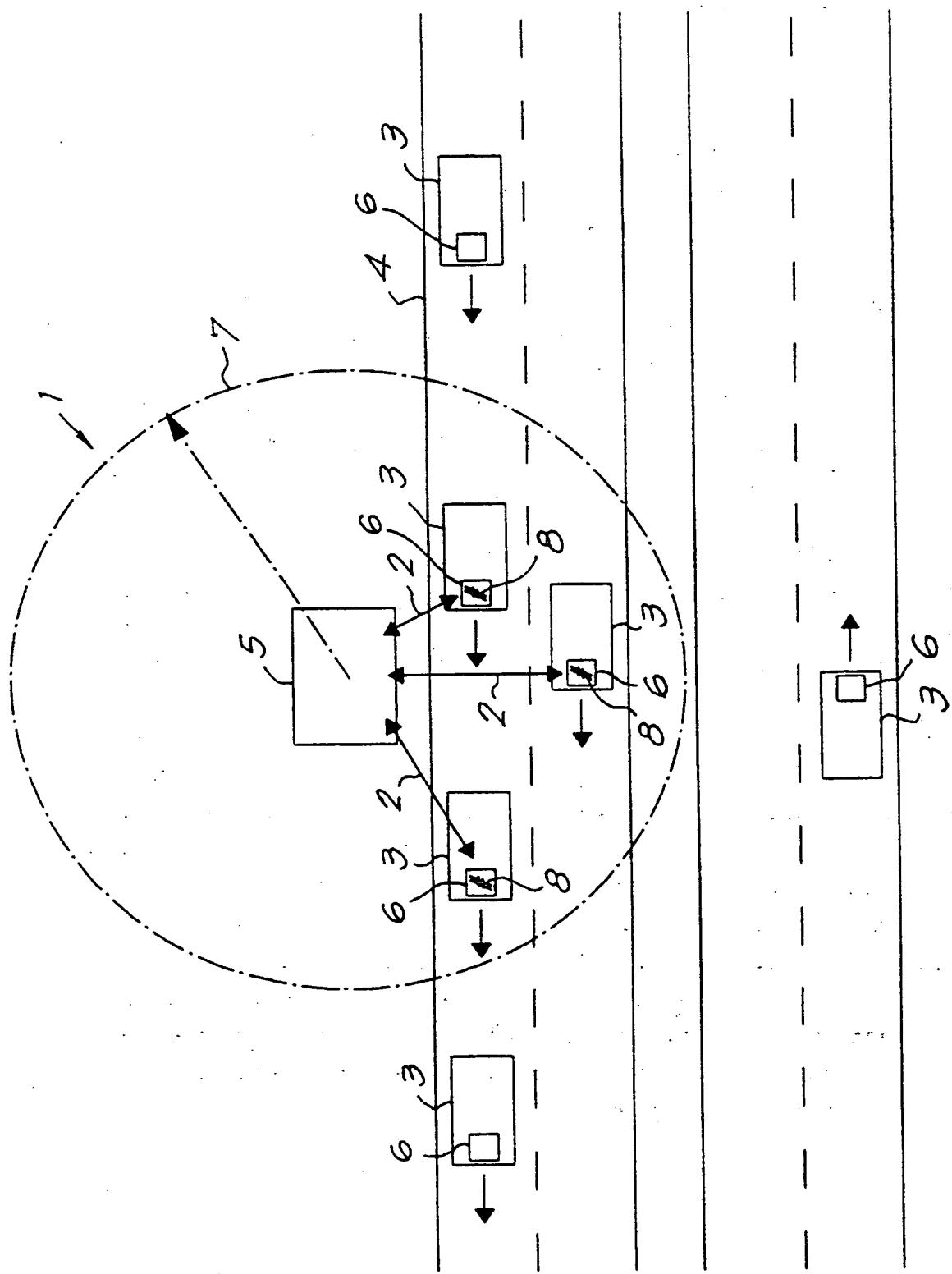
characterized in that the content of the communication (2) is secured.

6. Method according to claim 5, characterized in that the  
5 content of the communication (2) is secured by  
cryptographically transforming it.

7. Method according to any of the preceding claims,  
characterized in that the communication equipment (5)  
10 erected along the road (4) is mobile.

8. Method according to any of the preceding claims,  
characterized in that it is used for transmitting data  
during toll driving.

15 9. Device for realizing the method of claim 1,  
characterized in that it consists of the combination of  
a multiple of modules (6) which are to be build in and/or  
are built in respectively in vehicles (3) on the one  
20 hand, and communication equipment (5) which is erected  
and/or can be erected along the road (4) on the other  
hand, whereby these modules (6) and this communication  
equipment (5) is provided with electronics which make it  
possible for the communication equipment (5) to  
25 communicate with the modules (6) situated within the  
transmission and receiving range (7) of this  
communication equipment (5) by means of a wireless  
connection at short distance, such by means of a  
30 communication (2) making use of the "direct sequence  
spread centrum" principle, also called "direct access  
broad spectrum" principle.



# INTERNATIONAL SEARCH REPORT

National Application No

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**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 6 G08G1/017 G08G1/0967 G07B15/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G07B G07C G08G H04B H04J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>WO 89 04093 A (NYSEN PAUL A ;TOBIAS RAPHAEL (AU)) 5 May 1989            see abstract; claims; figures            see page 1, line 25 - page 3, line 14            see page 10, line 17 - page 12, line 31            see page 39, line 1 - line 7            see page 53, line 3 - line 22</p> <p>---</p>	1-9
Y	<p>US 5 488 631 A (GOLD KENNETH S ET AL) 30 January 1996            see abstract; figures            see column 1, line 9 - column 2, line 4            see column 6, line 10 - line 41</p> <p>---</p> <p style="text-align: center;">-/-</p>	1-6, 9

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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